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DIURNAL FORCING OF PLANETARY ATMOSPHERES

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Submitted to

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Accomplishments

Much progress has been made on calculations of the Martian seasonal water cycle using the Mars Climate Model developed for this purpose. Two papers, documenting the model [Haberle et al., 1997] and the water transport results obtained with it [Houben et al., 1997a] have been published in the Journal of Geophysical Research - Planets. An additional paper describing results related to the evolution of the seasonal water cycle as a result of orbital changes [Houben et al., 1997b] was published in Advances in Space Research. Since that time, further studies have concentrated on the consequences of the soil adsorption required to match the observed water cycle and its relation to the stability of ground ice and other potential water reservoirs. Some of this work was reported at the Division for Planetary Sciences Meeting in Cambridge, MA [Houben, 1997]. Daily predictions of the Martian atmospheric water vapor distribution have been incorporated in the Mars Today web pages: [http://www-mgcm.arc.nasa.gov].

Earth-related studies have concentrated on incorporating an efficient and realistic microphysical model into the Ames Stratospheric General Circulation Model used to simulate the spread of the Mt. Pinatubo and other volcanic clouds in the stratosphere. Papers presenting various levels of completion of this effort were presented at the Fall 1996 American Geophysical Union Meeting [Houben et al., 1996], the Upper Atmosphere Research Satellite (UARS) Science Team Meeting in San Antonio, and the American Meteorological Society's Middle Atmospheres Meeting in Tacoma, WA. A paper reporting on the radiative forcing by the Pinatubo cloud based on these calculations, but utilizing the dynamics of the Langley General Circulation Model has been submitted to the Journal of Geophysical Research - Atmospheres [Kleb et al., 1997]. In addition, visualizations of the simulations are being incorporated into a video describing the UARS mission.

Future work will concentrate on the following areas: Publication of the Martian ground ice stability results and also of simulations of the diurnal water cycle. Calculations of the Martian seasonal cycle under dusty conditions are continuing. A paper describing the new stratospheric aerosol microphysics package (and its consequences for volcanic cloud evolution) will be submitted in the near future. The paper will discuss the relative importance of condensation and coagulation to early particle growth and the separation of the cloud by sedimentation of the larger particles. A more general paper which highlights the observation that particle number densities did not increase dramatically after the Mt. Pinatubo eruption is planned. Simulations of atmospheric transport will be extended to include studies of terrestrial tropospheric tracers using the Fifth-Generation Penn State/NCAR Mesoscale Model.

References

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